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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/811,596

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Xiaodong Cui

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EXAMINER

RIDER, JUSTIN W

ART UNIT

PAPER NUMBER

2626

NOTIFICATION DATE

DELIVERY MODE

06/27/2008

ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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<b>Office Action Summary</b>	<b>Application No.</b> 10/811,596	<b>Applicant(s)</b> CUI ET AL.	
	<b>Examiner</b> JUSTIN W. RIDER	<b>Art Unit</b> 2626	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 29 May 2008.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 3-12 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 3-12 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

***Response to Amendment***

1. In response to the Office Action mailed 31 March 2008, applicant submitted a response filed 29 May 2008, in which the applicant amended claims 2-9 and 11-12 without adding new matter. Claims 1 and 2 have been cancelled.

On behalf of the office, the examiner apologizes for prolonging prosecution. However, after a final search, new prior art was discovered that is relevant to speech recognition model adaptation specifically pertaining to the adaptation of covariance.

***Claim Rejections - 35 USC § 102***

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 3-4, 6, 10 and 12 are rejected under 35 U.S.C. 102(e) as being anticipated by **He et al. 'Minimum Classification Error (MCE) Model Adaptation of Continuous Density HMMs' EUROSPEECH-2003, September 1-4, 2003, 1629-1632** referred to as **HE** hereinafter.

Claim 12: **HE** discloses a method of updating a model for speech recognition (Abstract, *The MCELR approach is evaluated on large vocabulary speech recognition tasks.*) comprising:

i. adjusting a covariance associated with the model by a scaling factor to provide an adjusted [adapted] variance (page 1631, section 4, *'Then for the  $m$ -th Gaussian component  $N(\mu_{m,r}, \Sigma_{m,r})$  the adapted covariance is given by...*');

ii. updating the scaling factor [Gaussian component] based on a speech signal to be recognized (page 1631, Section 4, *'the Gaussian component is characterized by its mean and covariance matrix and denoted generically as...*'), wherein the speech signal is to be recognized using the model (page 1631, Section 5.1, *'The speech recognition experiments were performed on...*');

iii. updating the scaling factor each time new data of the speech signal is available and calculating a new scaling factor by adding a correction item to a previous scaling factor (page 1631, Section 4, *'the Gaussian component is characterized by its mean and covariance matrix and denoted generically as...'* And since the component is characterized by the adaptively updated covariance, the scaling factor inherently gets updated.); and

iv. updating the model using the adjusted covariance (page 1629, Introduction describes how the main intent of the experiment is the updating [adaptation] of speech models.).

Claim 3: **HE** discloses a method for updating covariance of a speech signal as per claim 12 above, wherein the scaling factor is a scaling matrix (page 1631, Section 4, *'the Gaussian component is characterized by its mean and covariance matrix and denoted generically as...*).

Claim 4: **HE** discloses a method for updating covariance of a speech signal as per claim 12 above, wherein the new available data of the signals is based on any length (page 1631, Section 5.1, e.g. triphones).

Claim 6: **HE** discloses a method for updating covariance of a speech signal as per claim 12 above, wherein the new available data of the signals is an utterance (page 1631, Section 5.1).

Claim 10: **HE** discloses a method as per claim 3 above, wherein the scaling matrix is a diagonal matrix (page 1632, Section 5.1, '*In adaptation, diagonal transformation matrices are used for variance adaptation...*').

### ***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 5, 7 and 9 rejected under 35 U.S.C. 103(a) as being unpatentable over **HE** in view of **Eberman et al. (US Patent No. 5,924,065)** referred to as **EBERMAN** hereinafter.

Claim 5: **HE** discloses a method for updating covariance of a speech signal as per claim 12 above, however failing to but **EBERMAN** does specifically disclose wherein the new available data of the signals is a frame (col. 5, lines 22-23).

Therefore, it would have been obvious to one possessing ordinary skill in the art at the time of invention to include the teachings of **EBERMAN** in the method of **HE** because it provides a way to efficiently compensate for dirty or noisy speech signals based on environmental estimations so that speech can be more naturally represented (col. 3, line 60 - col. 4, line 10).

Claim 7: **HE** discloses a method for updating covariance of a speech signal as per claim 12 above, however failing to but **EBERMAN** does specifically disclose wherein the new available data of the signals is a fixed time period (col. 5, lines 22-23, a frame inherently encompasses a fixed period of time in a frequency-domain representation.).

Therefore, it would have been obvious to one possessing ordinary skill in the art at the time of invention to include the teachings of **EBERMAN** in the method of **HE** because it provides a way to efficiently compensate for dirty or noisy speech signals based on environmental estimations so that speech can be more naturally represented (col. 3, line 60 - col. 4, line 10).

Claim 9: **HE** discloses a method for updating covariance of a speech signal as per claim 12 above, however failing to but **EBERMAN** does specifically disclose wherein the correction is the product of any sequence whose limit is zero, whose summation is infinity and whose square summation is not infinity and a summation of quantities weighted by a probability (col. 6, lines 31-34, *'In the EM process described below, an expectation step and a maximization step are iteratively performed to converge towards an optimal result during a gradient ascent;'* col. 6, lines 47-49, *'because a robust speech processing system only needs to estimate some overall parametric statistic which can be estimated from the distribution using the EM [Expectation Maximization]process.'* [emphasis supplied].

Therefore, it would have been obvious to one possessing ordinary skill in the art at the time of invention to include the teachings of **EBERMAN** in the method of **HE** because it provides a way to efficiently compensate for dirty or noisy speech signals based on

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environmental estimations so that speech can be more naturally represented (col. 3, line 60 - col. 4, line 10).

6. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over **HE** in view of **Stylianou (US Patent No. 6,266,638)** referred to as **STYLIANOU** hereinafter.

Claim 8: **HE** discloses a method as per claim 1 above, however failing to but **STYLIANOU** does, specifically disclose wherein a 10 minute segment of input speech is obtained in order to provide speech parameters (col. 3, lines 27-29, *'We have typically used between 3 and four segments (about 10 minutes of speech) for getting a good estimate of the parameters.'*).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to include the teachings of **STYLIANOU** in the method of **HE** because it provides a more comprehensive representation of input speech in order to make more accurate estimations with respect to key speech parameters (col. 2, SUMMARY).

7. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over **HE** in view of **Rajan (US 2002/0026253 A1)** referred to as **RAJAN** hereinafter.

Claim 11: **HE** discloses a method as per claim 1 above, however failing to specifically disclose wherein the variance-scaling factor is exponential. However, referring back to applicant's specification, the intent behind exponential scaling factors is to ensure positiveness for the updated variance values (page 5, paragraph [0018]). In an analogous art, **RAJAN**

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discloses a speech processing system wherein it is disclosed that variances used in updating parameters are always positive (page 5, Paragraph [0056]).

Therefore, it would have been obvious to one possessing ordinary skill in the art at the time of invention to include the teachings of **RAJAN** in the method of **HE** because presenting finite values in exponential form inherently ensures a positive value and **RAJAN** discloses this fact in implementing speech signal reconstruction processing that ensures accurate matching of reconstructed pieces.

### ***Conclusion***

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. **Chou *et al.* "Maximum a posteriori linear regression (MAPLR) variance adaptation for continuous density HMMS", In EUROSPEECH-2003, 1513-1516.**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JUSTIN W. RIDER whose telephone number is (571)270-1068. The examiner can normally be reached on Monday - Friday 8:30AM - 5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David R. Hudspeth can be reached on (571) 272-7843. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.



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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>.

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/J. W. R./  
Examiner, Art Unit 2626  
20 June 2008

/David R Hudspeth/

Supervisory Patent Examiner, Art Unit 2626